

CLAIMS

1. A system for pumping multiphase fluids, the system including:
 - a phase separator that is connected to receive a LP multiphase fluid, and is constructed and arranged to separate a LP gas phase and a LP liquid phase from the LP multiphase fluid;
 - a gas-gas jet pump having a LP inlet connected to receive the LP gas phase from the phase separator, a HP inlet connected to receive a HP gas supply from a sustainable gas source, and an outlet for providing outlet gas at a pressure higher than that of the LP gas phase;
 - and a liquid pump having a LP inlet connected to receive the LP liquid phase from the phase separator, and an outlet for providing outlet liquid at a pressure higher than that of the LP liquid phase.
2. A system according to claim 1, wherein the sustainable gas source comprises a supply of lift gas or export gas.
3. A system according to claim 1, wherein the sustainable gas source comprises a supply of steam from geothermal wells.
4. A system according to any one of the preceding claims, wherein the sustainable gas source includes a compressor.
5. A system according to any one of the preceding claims, wherein the HP gas supply has a pressure at least twice that of the LP gas phase.
6. A system according to any one of the preceding claims, wherein the gas-gas jet pump has an outlet pressure in the range 1.1 to 3.0 times the pressure of the LP multiphase fluid.
7. A system according to any one of the preceding claims, wherein the liquid pump is a mechanical pump.
8. A system according to claim 7, wherein the liquid pump is a positive displacement pump.

9. A system according to claim 7 or claim 8, wherein the liquid pump has an outlet pressure similar to that of the gas-gas jet pump.
10. A system according to any one of claims 1 to 6, wherein the liquid pump is a liquid-liquid jet pump having a LP inlet connected to receive the LP liquid phase from the phase separator, a HP inlet connected to receive a HP liquid supply from a sustainable liquid source, and an outlet for providing outlet liquid at a pressure higher than that of the LP liquid phase
11. A system according to claim 10, wherein the sustainable liquid source comprises a supply of injection water.
12. A system according to claim 10, wherein the sustainable liquid source comprises a supply of export oil.
13. A system according to any one of claims 10 to 12, wherein the sustainable liquid source has a pressure at least twice that of the LP liquid phase.
14. A system according to any one claims 10 to 13, wherein the liquid-liquid jet pump has an outlet pressure in the range 1.1 to 3.0 times that of the LP liquid phase.
15. A system according to any one of the preceding claims, including a knock-out vessel for removing retained liquid from the LP gas phase.
16. A system according to claim 15, wherein the knock-out vessel has a liquid outlet connected to deliver removed liquid to the liquid pump.
17. A system according to any one of the preceding claims, wherein the separator is a cyclone type separator.
18. A system according to any one of the preceding claims, including a mixing device connected to the outlets of the jet pump and the liquid pump, for combining the outlet gas and the outlet liquid and providing a combined multiphase outlet fluid at a pressure higher than that of the LP multiphase fluid
19. A system according to claim 18, wherein the mixing device is a commingler.
20. A system according to claim 18 or claim 19, wherein the combined multiphase outlet fluid has an outlet pressure in the range 1.1 to 3.0 times that of the LP liquid phase.

21. A system according to any one of claims 18 to 20, wherein the multiphase fluid is a petroleum gas/oil mixture.
22. A system according to claim 21, wherein the gas/liquid ratio of the petroleum gas/oil mixture is in the range 9 to 49 at the operating pressure and temperature.
23. A process for pumping multiphase fluids, the process including:
 - separating a LP multiphase fluid into a LP gas phase and a LP liquid phase;
 - increasing the pressure of the LP gas phase using a gas-gas jet pump, by supplying a HP gas supply from a sustainable gas source to a HP inlet of the jet pump and supplying the LP gas phase to a LP inlet of the jet pump;
 - and increasing the pressure of the LP liquid phase using a liquid pump.
24. A process according to claim 23, wherein the sustainable gas source comprises a supply of lift gas.
25. A process according to claim 23, wherein the sustainable gas source comprises a supply of export gas.
26. A process according to any one of claims 23-25, wherein the sustainable gas source has a pressure at least twice that of the LP gas phase.
27. A process according to any one of claims 23-26, wherein the gas-gas jet pump has an outlet pressure in the range 1.1 to 3.0 times the pressure of the LP multiphase fluid.
28. A process according to any one of claims 23-27, wherein the liquid pump is a mechanical pump.
29. A process according to claim 28, wherein the liquid pump has an outlet pressure in the range 1.1 to 3.0 times the pressure of the LP multiphase fluid.
30. A process according to any one of claims 23 to 27, wherein the liquid pump is a liquid-liquid jet pump having a LP inlet connected to receive the LP liquid phase, and a HP inlet connected to receive a HP liquid supply from a sustainable liquid source.

31. A process according to claim 30, wherein the sustainable liquid source comprises a supply of injection water.
32. A process according to claim 31, wherein the sustainable liquid source comprises a supply of export oil.
33. A process according to any one of claims 23-32, wherein the sustainable liquid source has a pressure at least twice that of the LP multiphase fluid.
34. A process according to any one of claims 23-33, wherein the liquid-liquid jet pump has an outlet pressure in the range 1.1 to 3.0 times that of the LP multiphase fluid.
35. A process according to any one of claims 23-34, in which retained liquid is removed from the LP gas phase using a knock-out vessel.
36. A process according to claim 35, wherein removed liquid is delivered to the liquid pump.
37. A process according to any one of claims 23-36, wherein the LP gas and liquid phases are separated in a cyclone type separator.
38. A process according to any one of claims 23-37, including mixing the increased pressure gas and liquid phases to provide a combined multiphase fluid at a pressure higher than that of the LP multiphase fluid
39. A process according to claim 38, wherein increased pressure gas and liquid phases are mixed in a commingler.
40. A process according to any one of claims 38-39, wherein the combined multiphase outlet fluid has an outlet pressure in the range 1.1 to 3.0 times that of the LP multiphase fluid.
41. A process according to any one of claims 38-40, wherein the multiphase fluid is a petroleum gas/oil mixture.
42. A process according to claim 41, wherein the gas/liquid ratio of the petroleum gas/oil mixture is in the range 9 to 49 at the operating pressure and temperatures.